of parallel bitstreams;

phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

summing the modulated carrier instances and transmitting the result of said summation.

36. A method according to claim 35, wherein each spreading signal is produced by phase modulating a common finite spreading sequence with a respective cyclic signal, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

37. A method according to claim 36, wherein said cyclic signals are substantially sinusoidal.

38. A method according to claim 37, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

39. A method according to claim 35, wherein one of the spreading signals is comprises a finite spreading sequence and the other spreading signals are each produced by phase modulating said finite spreading sequence with a respective cyclic signals, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

40. A method according to claim 39, wherein said cyclic signals are substantially sinusoidal.

41. A method according to claim 40, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

42. A method according to claim 35, wherein said spreading sequence c[.] is derived from a first code a[.] and a second code b[.] according to

$$c[n]=\left[a[0]\vec{b},a[1]\vec{b},\ldots,a[M-1]\vec{b}\right].$$

43. A method according to claim 42, wherein the Fourier transforms of the first and second codes satisfy: $s[t]\leftrightarrow S(e^{j\omega})\neq 0 \text{ for all } \omega$

where s and S represent the first and second codes in the time and frequency domains respectively.

44. A method according to claim 35, wherein said bitstreams comprise bits of a single digital signal such that groups of bits of said single digital

signal are transmitted in parallel.

45. A transmitter comprising:

a source of digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

first means for phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

second means for phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

a summer for summing the modulated carrier instances.

46. A transmitter according to claim 45, wherein the first means comprises means for producing each spreading signal by phase modulating a common finite spreading sequence with a respective cyclic signal, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

47. A transmitter according to claim 46, wherein said cyclic signals are substantially sinusoidal.

48. A transmitter according to claim 47, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of

said spreading sequence.

49. A transmitter according to claim 45, wherein the first means comprises means for producing one of the spreading signals by generating a finite spreading sequence and producing the other spreading signals by phase modulating said finite spreading sequence with a respective cyclic signal, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

50. A transmitter according to claim 49, wherein said cyclic signals are substantially sinusoidal.

51. A transmitter according to claim 50, wherein said cyclic signals are stepped since waves, each step having the same duration as chips of said spreading sequence.

52. A tramsitter according to claim 45, wherein said spreading sequence c[.] is derived from a first code a[.] and a second code b[.] according to

$$c[n]=\left[a[0]\vec{b},a[1]\vec{b},\ldots,a[M-1]\vec{b}\right].$$

53. A transmitter according to claim 52, wherein the Fourier transforms of the first and second codes satisfy: $s[t]\leftrightarrow S(e^{j\omega})\neq 0 \text{ for all } \omega$

where s and S represent the first and second codes in the time and

frequency domains respectively.

54. A transmitter according to claim 45, wherein the source of digital data signals includes means for generating said bitstreams from a single digital signal such that groups of bits of said signal digital signal are transmitted in parallel.

55. A transmitter according to claim 54, wherein said means for generating said bitstreams comprises a digital signal processor.

56. A transmitter according to claim 45, wherein the first means comprises a digital signal processor.

57. A transmitter according to claim 45, wherein the second means comprises a plurality of analog phase modulators.

58. A mobile phone including a transmitter, the transmitter comprising:

a source of digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

first means for phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

second means for phase modulating respective instances of a carrier with said modulating signals to produce a plurality to

modulated carrier instances; and

a summer for summing the modulated carrier instances.

59. A mobile phone according to claim 58, wherein the first means comprises means for producing each spreading signal by phase modulating a common finite spreading sequence with a respective cyclic signals, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

60. A mobile phone according to claim 59, wherein said cyclic signals are substantially sinusoidal.

61. A mobile phone according to claim 60, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

62. A mobile phone according to claim 58, wherein the first means comprises means for producing one of the spreading signals by generating a finite spreading sequence and producing the other spreading signals by phase modulating said finite spreading sequence with a respective cyclic signals, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

63. A mobile phone according to claim 62, wherein said cyclic signals are substantially sinusoidal.

64. A mobile phone according to claim 63, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

65. A mobile phone according to claim 55, wherein said spreading sequence c[.] is derived from a first code a[.] and a second code b[.] according to

$$c[n] = \left[a[0]\vec{b}, a[1]\vec{b}, \ldots, a[M-1]\vec{b}\right].$$

66. A mobile phone according to claim 65, wherein the Fourier transforms of the first and second codes satisfy:

$$s[t] \leftrightarrow S(e^{j\omega}) \neq 0 \text{ for all } \omega$$

where s and S represent the first and second codes in the time and frequency domains respectively.

67. A mobile phone according to claim 58, wherein the source of digital data signals includes means for generating said bitstreams from a single digital signal such that groups of bits of said single digital signal are transmitted in parallel.

68. A mobile phone according to claim 67, wherein said means for generating said bitstreams comprises a digital signal processor.

69. A mobile phone according to claim 58, wherein the first means comprises a digital signal processor.

70. A mobile phone according to claim 58, wherein the second means comprises a plurality of analogue phase modulators.

71. A base station of a mobile phone network including a transmitter the transmitter comprising:

a source of digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

first means for phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

second means for phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

a summer for summing the modulated carrier instances.

72. A base station according to claim 71, wherein the first means comprises means for producing each spreading signals by phase modulating a common finite spreading sequence with a respective

cyclic signal, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

73. A base station according to claim 72, wherein said cyclic signals are substantially sinusoidal.

74. A base station according to claim 73, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

75. A base station according to claim 71, wherein the first means comprises means for producing one of the spreading signals by generating a finite spreading sequence and producing the other spreading signals by phase modulating said finite spreading sequence with a respective cyclic signals, said cyclic signals being such that each completes an integer number of cycles in the duration of said spreading sequence.

76. A base station according to claim 75, wherein said cyclic signals are substantially sinusoidal.

77. A base station according to claim 76, wherein said cyclic signals are stepped sine waves, each step having the same duration as chips of said spreading sequence.

78. A base station according to claim 71, wherein said spreading sequence c[.] is derived from a first code a[.] and a second code b[.] according to

$$c[n]=\left[a[0]\vec{b},a[1]\vec{b},\ldots,a[M-1]\vec{b}\right].$$

79. A base station according to claim 78, wherein the Fourier transforms of the first and second codes satisfy:

$$s[t]\leftrightarrow S(e^{j\omega})\neq 0\ \text{for all}\ \omega$$

where s and S represent the first and second codes in the time and frequency domains respectively.

80. A base station according to claim 78, wherein the source of digital data signals includes means for generating said bitstreams from a single digital signal such that groups of bits of said single digital signal are transmitted in parallel.

81. A base station according to claim 80, wherein said means for generating said bitstreams comprises a digital signal processor.

82. A base station according to claim 78, wherein the first means comprises a digital signal processor.

83. A mobile phone according to claim 78, wherein the second means comprises a plurality of analogy phase modulators.

84. A method of receiving a signal produced by a method according to claim 35, the method comprising the steps of:

producing a baseband signal, comprising components corresponding to the modulating signals, from a received rf signal; and

processing the baseband signal by processes adapted to extract the data from each of the modulating signals.

85. A method according to claim 84, wherein data bits extracted by said processes are combined into a single data signal.

86. A method according to claim 84, including mapping the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

87. A method according to claim 86, wherein data bits extracted by said processes are combined into a single data signal.

88. A method according to claim 84, wherein at least all but one of said processes comprises:

phase modulating the baseband signal by the inverse of a respective one of said cyclic signal to produce a first signal;

phase modulating instances of the first signal by respective cyclic signals of the form $e^{j2\pi nP/L}$ where P comprises the set of

values in the range 0, ...,L-1, and L is the length of the second code to produce L second signals;

filtering each of said second signals with a filter having a transfer function which is the inverse of the first code to produce respective third signals;

correlating the third signals with corresponding reference signals and summing the results of the said correlations.

89. A method according to claim 88, wherein data bits extracted by said processes are combined into a single data signal.

90. A method according to claim 88, including mapping the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

91. A method according to claim 90, wherein data bits extracted by said processes are combined into a single data signal.

92. A receiver for receiving a signal produced by a method according to claim 35, the receiver comprising:

rf processing means for producing a baseband signal, comprising components corresponding to the modulating signals, from a received rf signal; and

processing means for processing the baseband signal by

processes adapted to extract the data from each of the modulating signals.

93. A receiver according to claim 92, wherein the processing means combines the extracted data bits into a single data signal.

94. A receiver according to claim 92, wherein the processing means maps the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

95. A receiver according to claim 94, wherein the processing means combines the extracted data bits into a single data signal.

96. A receiver according to claim 92, wherein at least all but one of said processes comprises:

phase modulating the baseband signal by the inverse of a respective one of said cyclic signal to produce a first signal;

phase modulating instances of the first signal by respective cyclic signals of the form $e^{j2\pi nP/L}$ where P comprises the set of values in the range 0, ..., L-1, and L is the length of the second code to produce L second signals;

filtering each of said second signals with a filter having a transfer function which is the inverse of the first code to produce

respective third signals;

correlating the third signals with corresponding reference signals and summing the results of the said correlations.

97. A receiver according to claim 96, wherein the processing means combines the extracted data bits into a single data signal.

98. A receiver according to claim 96, wherein the processing means maps the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

99. A receiver according to claim 98, wherein the processing means combines the extracted data bits into a single data signal.

100. A receiver according to claim 92, wherein the processing means comprises a digital signal processor.

101. A mobile phone including a receiver, the receiver comprising:

rf processing means for producing a baseband signal, comprising components corresponding to the modulating signals, from a received rf signal; and

processing means for processing the baseband signal by processes which extract data from each of the modulating

signals.

102. A mobile phone according to claim 101, wherein the processing means combines the extracted data bits into a single data signal.

103. A mobile phone according to claim 101, wherein the processing means maps the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

104. A mobile phone according to claim 103, wherein the processing combines the extracted data bits into a single data signal.

105. A mobile phone according to claim 101, wherein at least all but one of said processes comprises:

phase modulating the baseband signal by the inverse of a respective one of said cyclic signal to produce a first signal; phase modulating instances of the first signal by respective cyclic signals of the form $e^{j2\pi nP/L}$ where P comprises the set of values in the range 0, ..., L-1, and L is the length of the second code to produce L second signals;

filtering each of said second signals with a filter having a transfer function which is the inverse of the first code to produce respective third signals;

correlating the third signals with corresponding reference signals and

summing the results of the said correlations.

106. A mobile phone according to claim 105, wherein the processing means combines the extracted data bits into a single data signal.

107. A mobile phone according to claim 105, wherein the processing means is configured for mapping the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

108. A mobile phone according to claim 103, wherein the processing means combines the extracted data bits into a single data signal.

109. A mobile phone according to claim 101, wherein the processing means comprises a digital signal processor.

110. A base station of a mobile phone network including a receiver, the receiver comprising:

rf processing means for producing a baseband signal, comprising components corresponding to the modulating signals, from a received rf signal; and

processing means for processing the baseband signal by

processes adapted to extract the data from each of the modulating signals.

111. A base station according to claim 110, wherein the processing means combines the extracted data bits into a single data signal.

112. A base station according to claim 110, wherein the processing means is configured for mapping the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

113. A base station according to claim 111, wherein the processing means combines the extracted data bits into a single data signal.

114. A base station according to claim 110, wherein at least all but one of said processes comprises:

phase modulating the baseband signal by the inverse of a respective one of said cyclic signal to produce a first signal;

phase modulating instances of the first signal by respective cyclic signals of the form $e^{j2\pi nP/L}$ where P comprises the set of values in the range 0, ..., L-1, and L is the length of the second code to produce L second signals;

filtering each of said second signals with a filter having a transfer function which is the inverse of the first code to produce

respective third signals;

correlating the third signals with corresponding reference signals and summing the results of the said correlations.

115. A base station according to claim 114, wherein the processing means combines the extracted data bits into a single data signal.

116. A base station according to claim 114, wherein the processing means maps the outputs of said processes onto a transmitted parallel bit pattern using a maximum likelihood algorithm and outputting said parallel bit pattern.

117. A base station according to claim 114, wherein the processing means combines the extracted data bits into a single data signal.

118. A base station according to claim 110, wherein the processing means comprises a digital signal processor.

119. A mobile phone network including a base station in communicative relation to a plurality of mobile phones,

the base station including a receiver comprising:

rf processing means for producing a baseband signals, comprising components corresponding to the modulating signals, from a received rf signal, and

processing means for processing the baseband signal by processes adapted to extract the data from each of the modulating signals; and each mobile phone including a transmitter comprising:

a source of digital data to be transmitted to a remote station as a plurality of parallel bitstreams;

first means for phase modulating said bitstreams with respective orthogonal or substantially orthogonal spectrum spreading signals to produce a plurality of modulating signals;

second means for phase modulating respective instances of a carrier with said modulating signals to produce a plurality to modulated carrier instances; and

a summer for summing the modulated carrier instances; wherein the mobile phones employ the same carrier frequency and spreading signals for communication with the base station, each mobile phone applying the spreading signals in a time offset manner relative to the ise of the spreading signals by each of the other mobile phones.

120. A method of RS-CTDMA operation in which , for a spreading code of length N=ML,

(a) L orthogonal codes, specified by $\{f_i\}=\{I+\ell *M\}$ ($\ell = 0,\ldots L-1$) for $i\varepsilon[0,M-1]$), are used to transmit up to L data bits parallel for a user in the ith cell;

(b) Users within one cell are time-offset by at least L chips to avoid or reduce intracell interuser interference; and

(c) M orthogonal spectral groups are used in difference cells.